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Kim

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(54) **POST FRAME FOR X-RAY APPARATUS AND
CEILING TYPE X-RAY APPARATUS WITH
THE SAME**

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(2013.01)

(58) **Field of Classification Search**
CPC A61B 6/4452; A61B 6/4464
USPC 378/197
See application file for complete search history.

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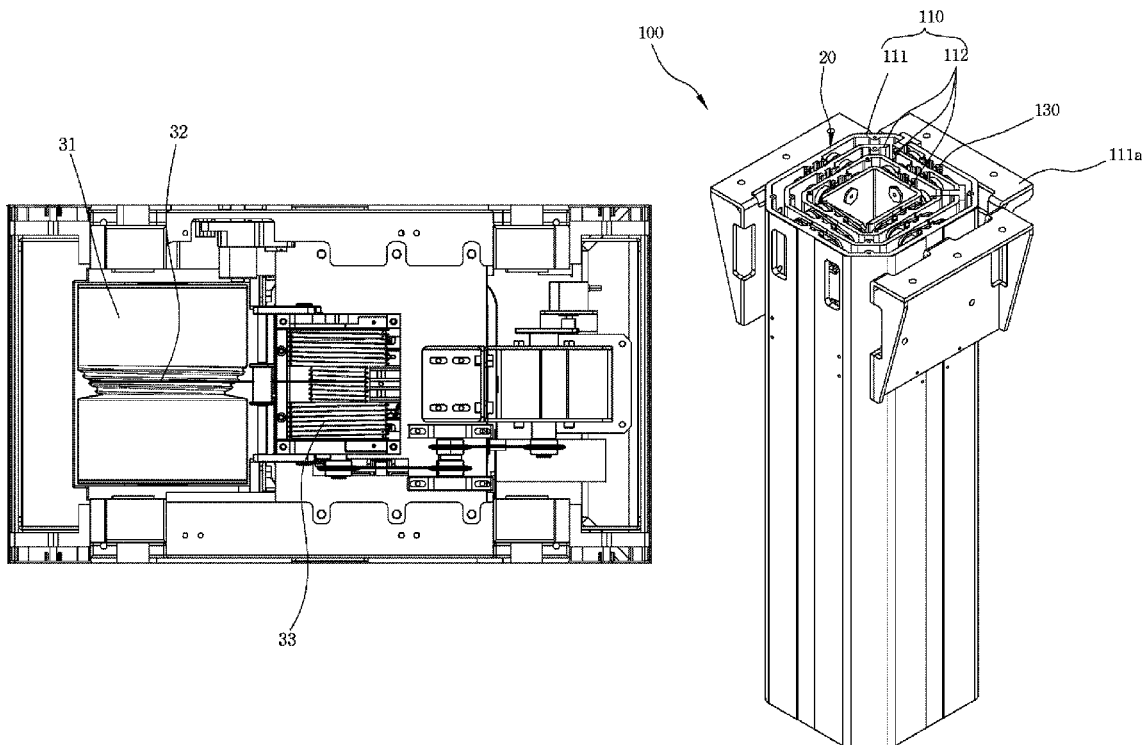
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(57) **ABSTRACT**

The present invention relates to a post frame for X-ray apparatus and a ceiling type X-ray apparatus. The post frame according to the present invention comprises: a main frame comprising a fixed frame fixed to the X-ray apparatus and a plurality of movable frames received by and arranged in the fixed frame; and a bearing part provided on the main frame, wherein the main frame comprises: a guide integrated with the main frame, that protrudes inward from the main frame and has an insertion groove at both sides; and a connecting bar that is inserted into the insertion grooves and is in contact with a bearing of the bearing part. Since the welding of the guide is not required, time and cost for manufacturing the post frame are reduced. The connecting bar can be assembled easily by simply inserting it into the guide groove.

3 Claims, 10 Drawing Sheets



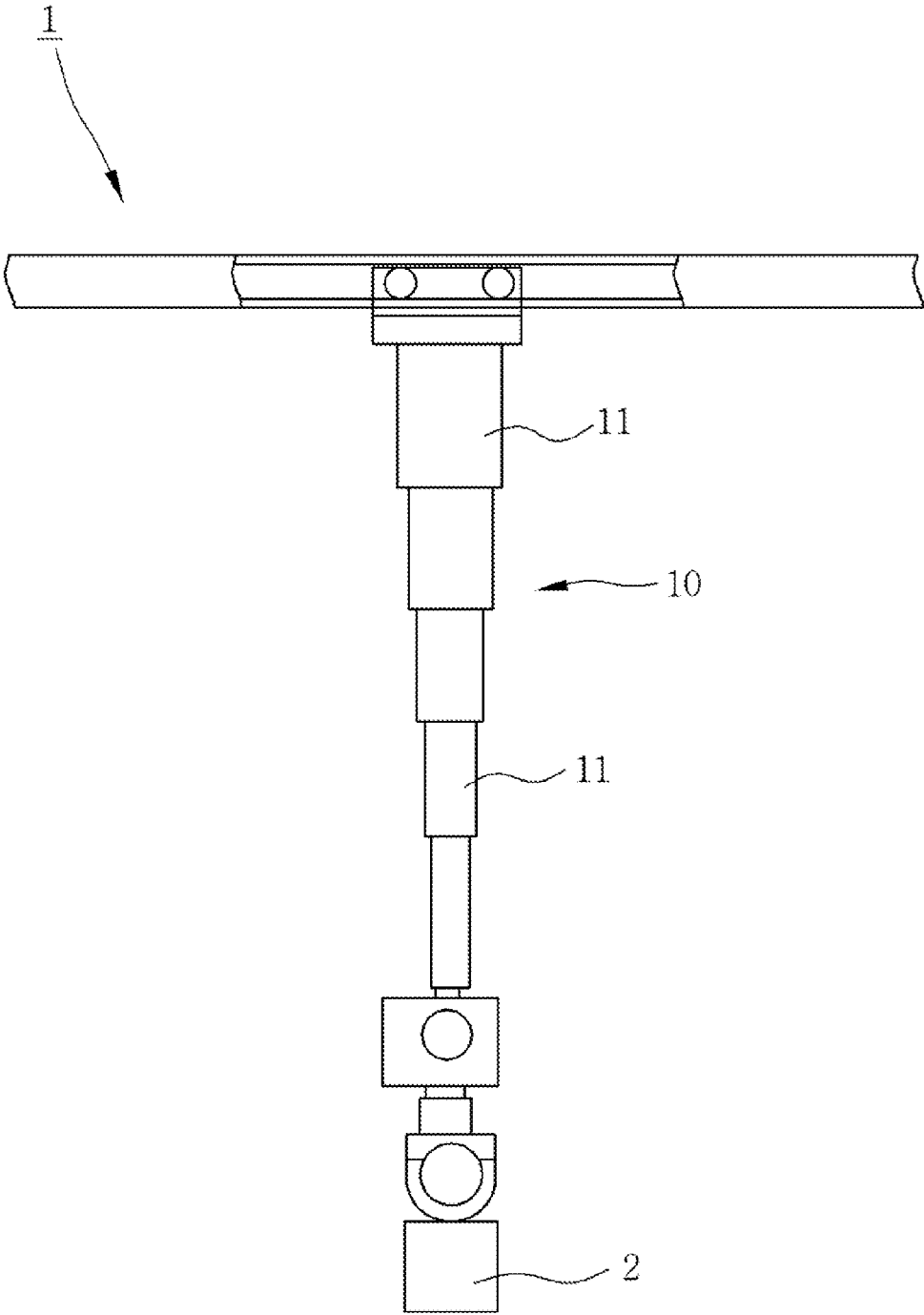
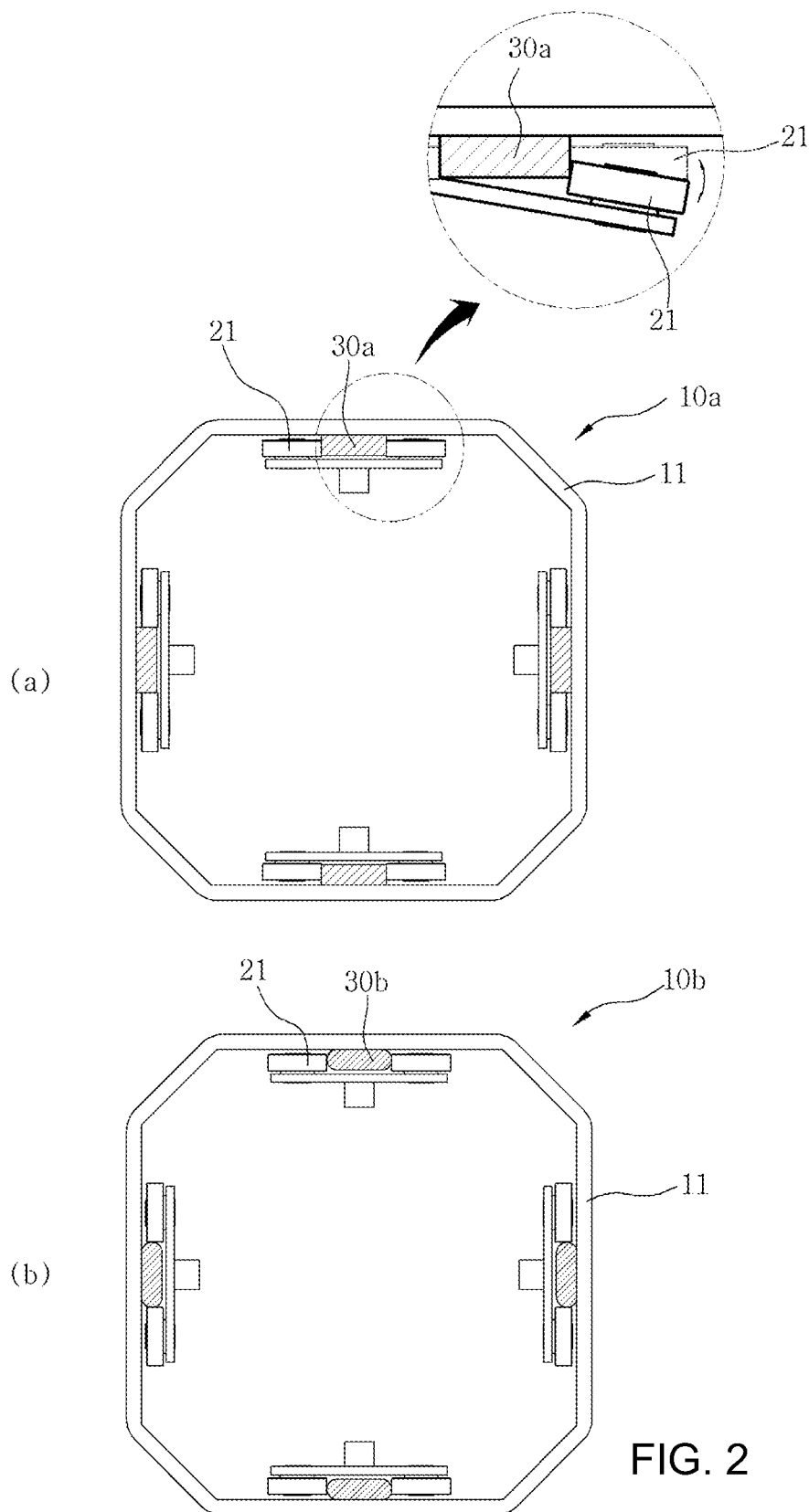


FIG. 1



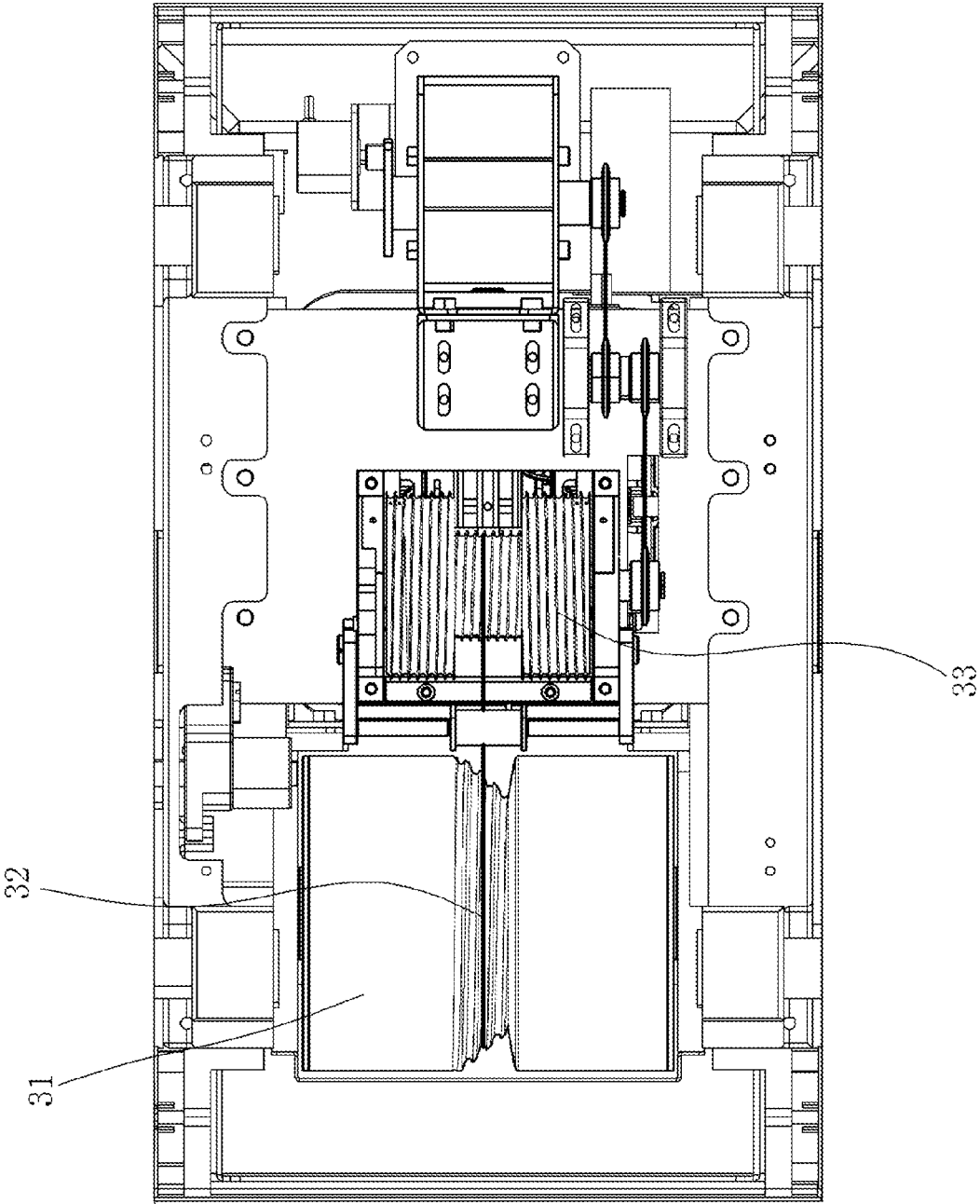
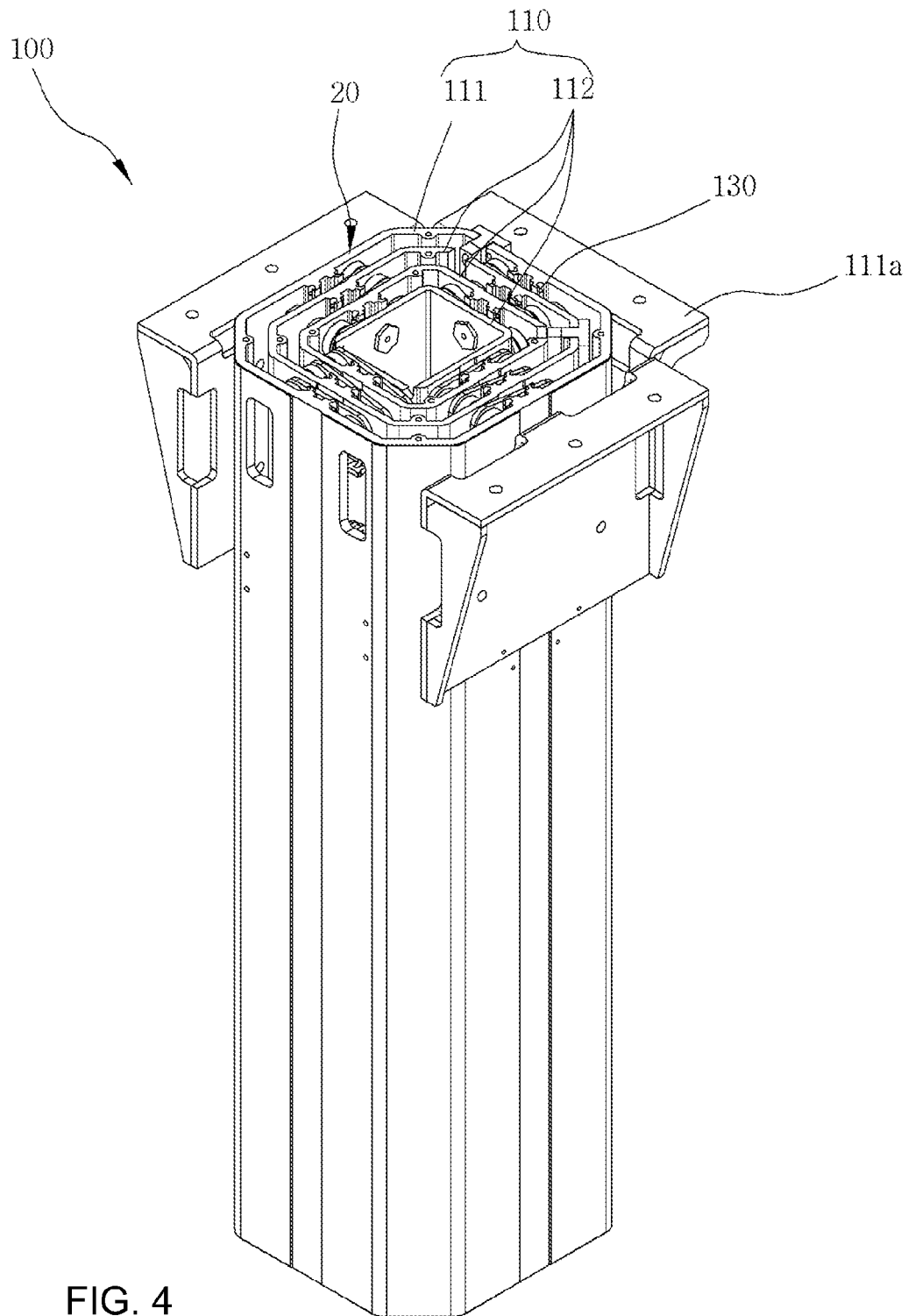
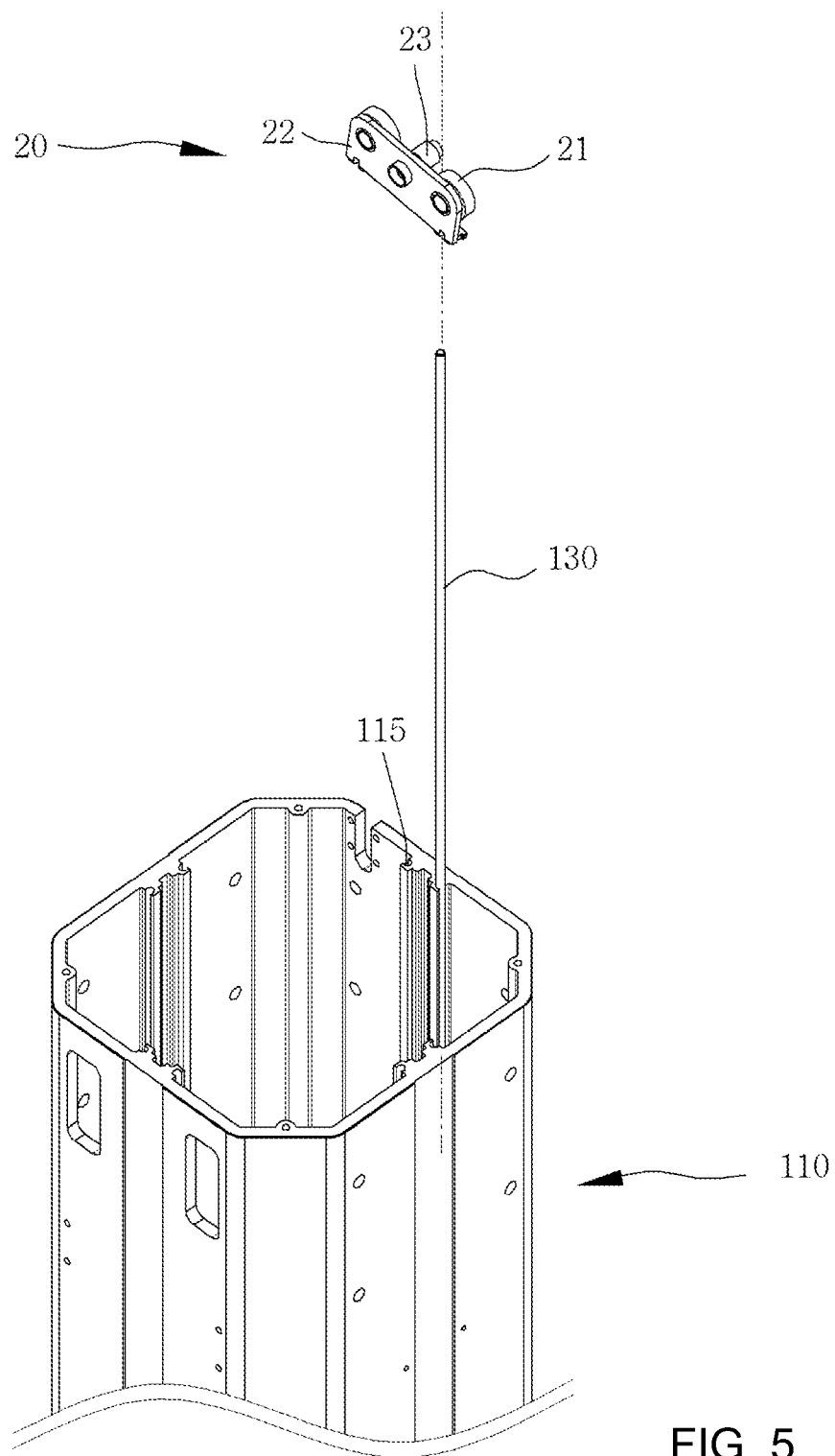


FIG. 3





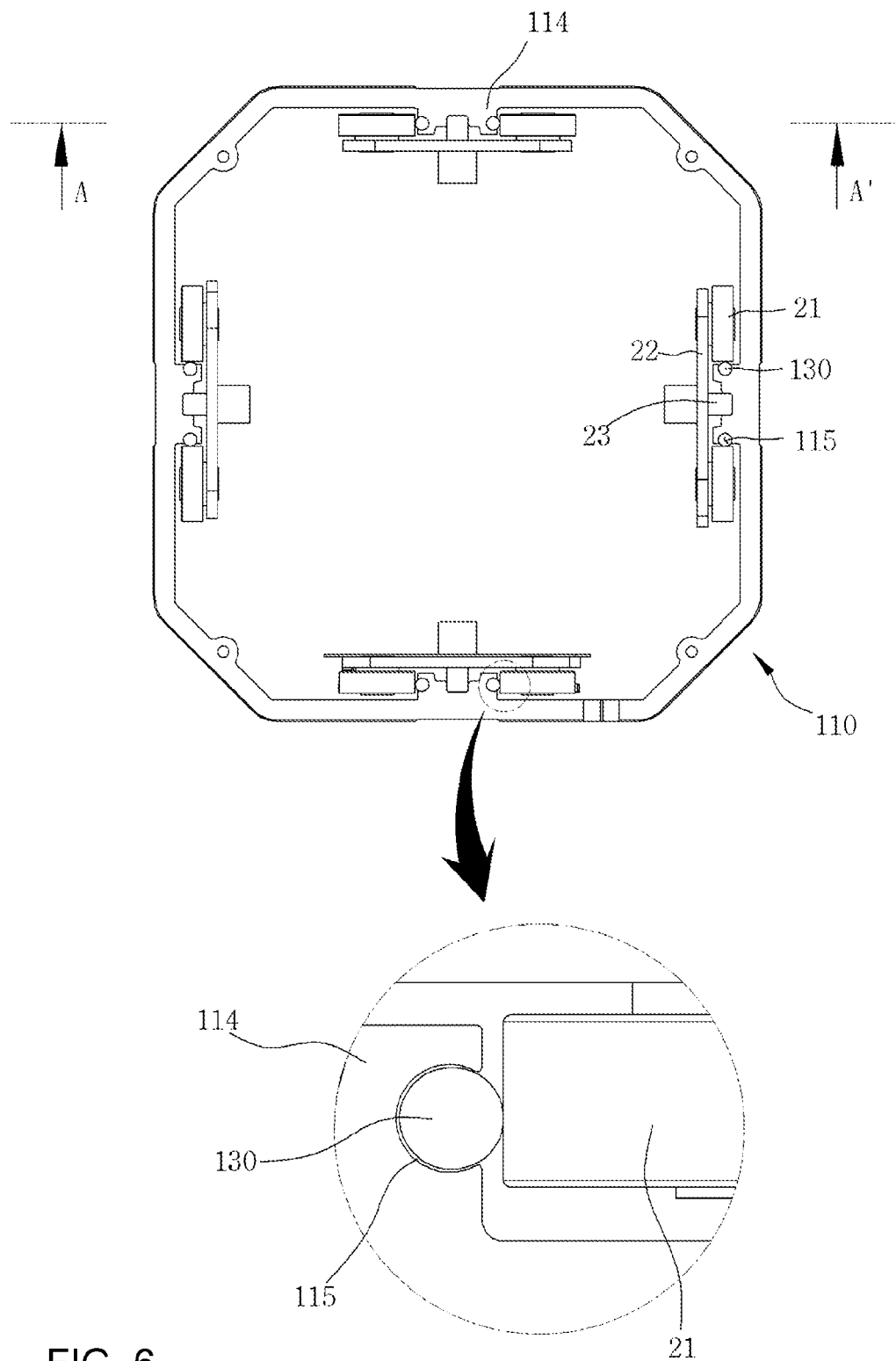


FIG. 6

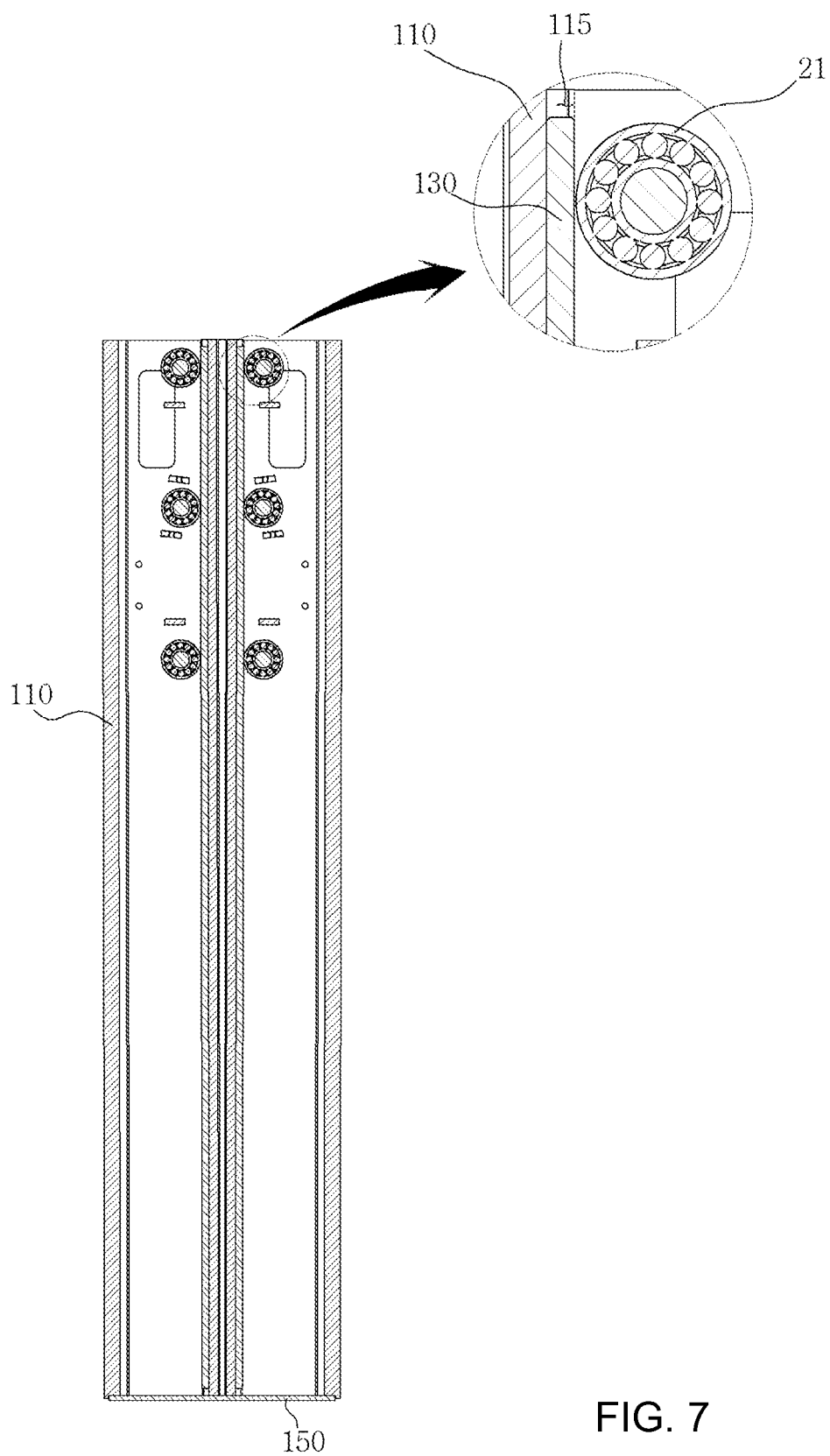


FIG. 7

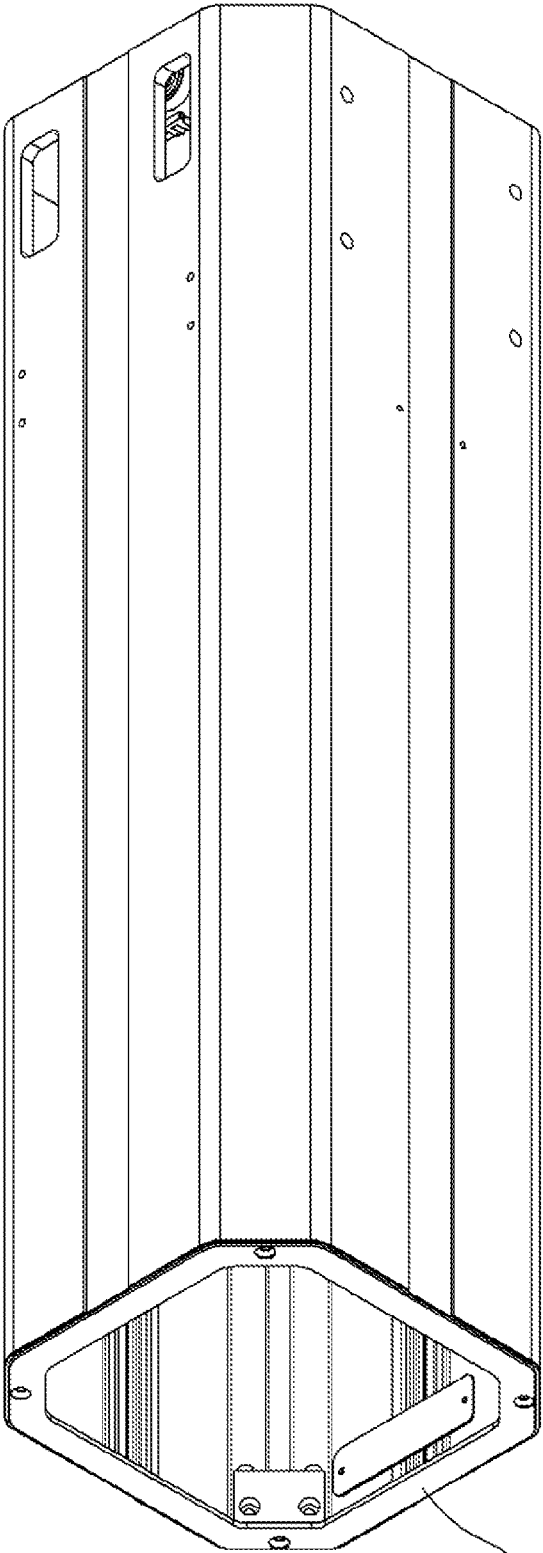
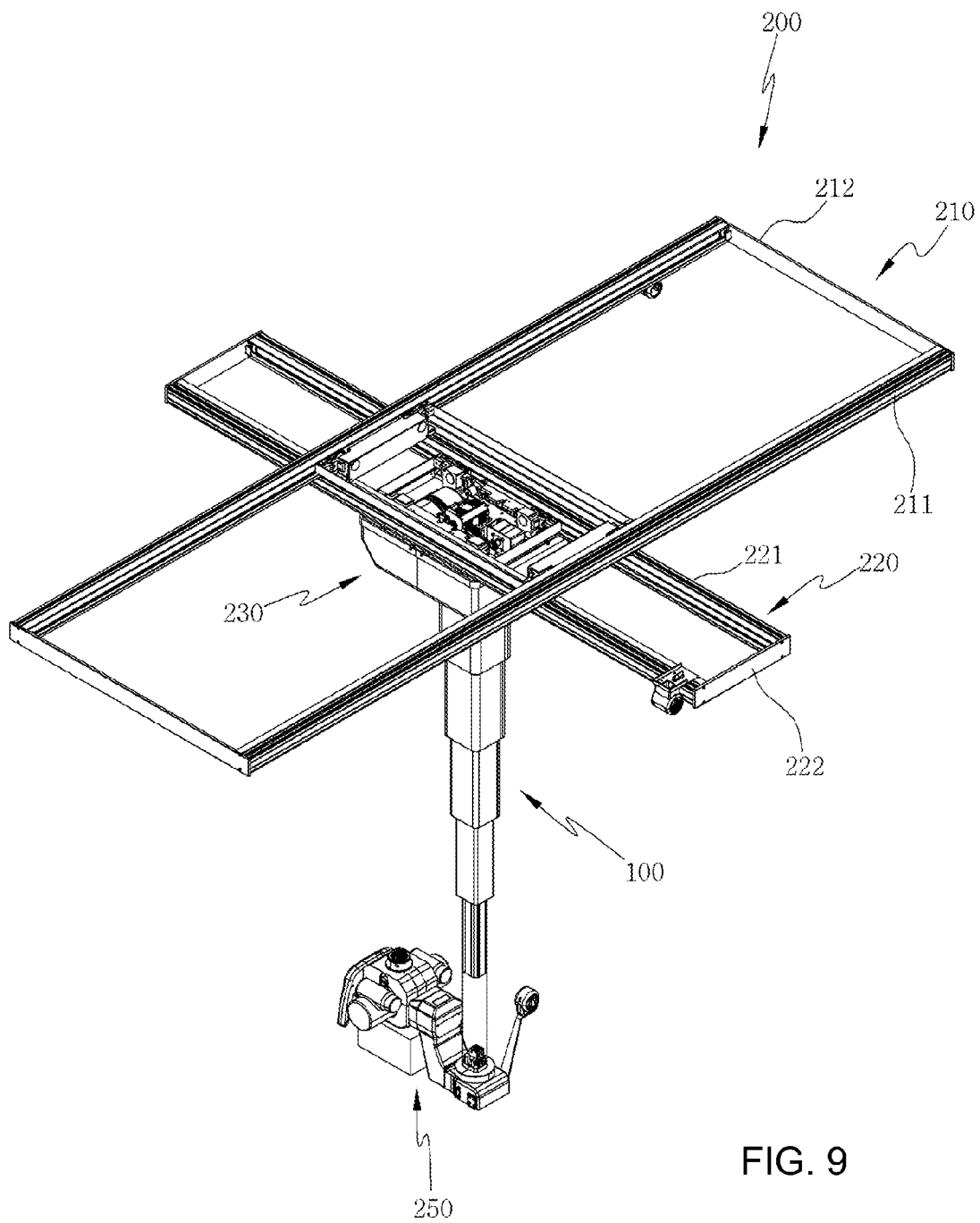


FIG. 8

150



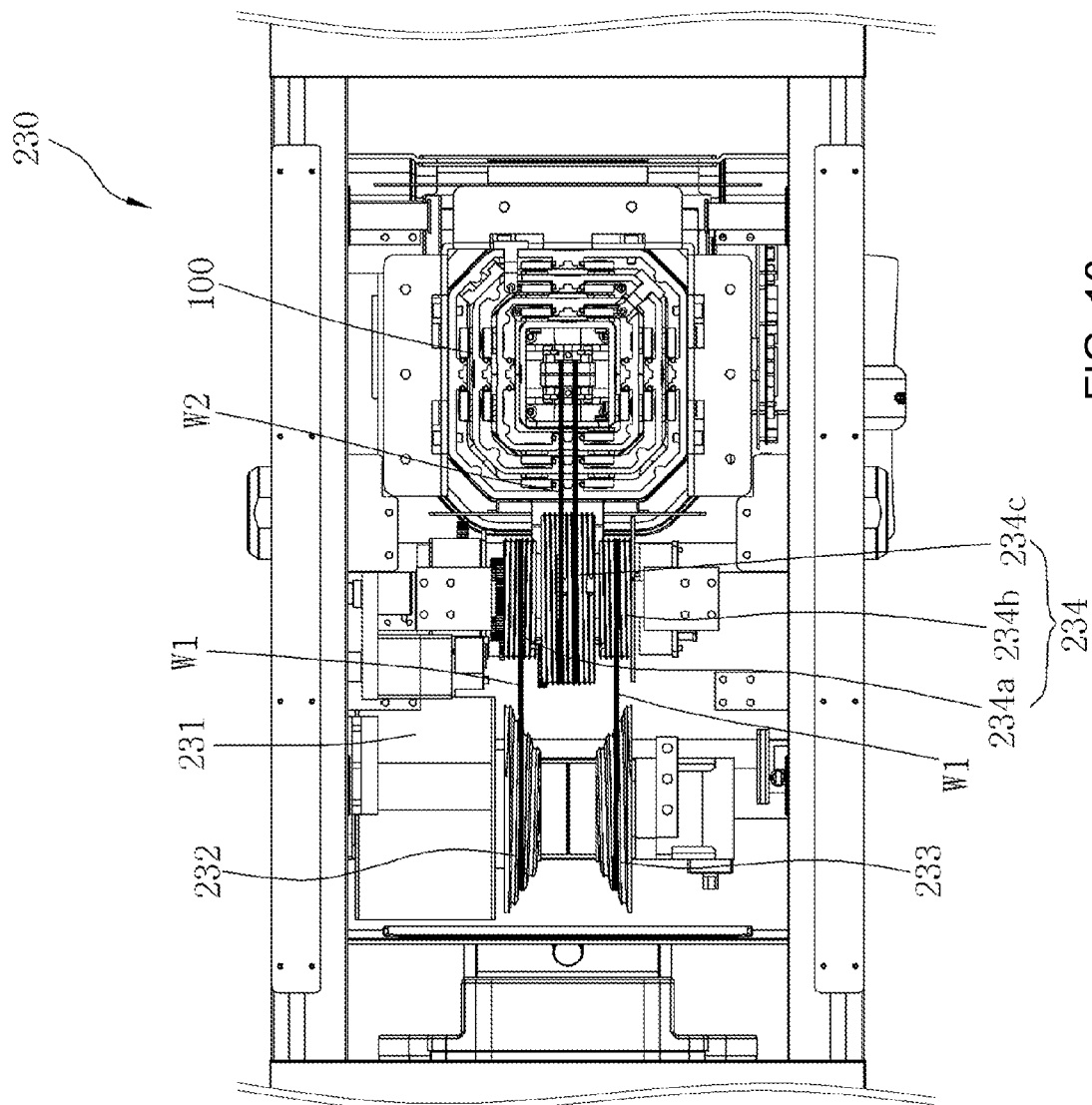


FIG. 10

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POST FRAME FOR X-RAY APPARATUS AND CEILING TYPE X-RAY APPARATUS WITH THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

This application is the claims priority to Korean Application No. KR 10-2011-0012682, filed Feb. 14, 2011.

BACKGROUND

A. Technical Field

The present invention relates to a post frame for X-ray apparatus and in particular a post frame provided on a ceiling type X-ray apparatus that reduces cost and provides a simple installation and durability.

The present invention also relates to a ceiling type X-ray apparatus that has the post frame, reduces a tension load difference of the spring balancer and prevents an accident.

B. Background of the Invention

In general, X-ray apparatus is used to carry out a visual inspection of internal diseases, in particular analyze whether there is any damage at a chest, a head, a digestive canal, a spine, or any other injured part by X-ray radiation.

Medical diagnosis device used in a hospital is configured to such that X-ray radiated from the X-ray tube penetrates an object to be examined such as a body of animal or human to detect the object.

Prior X-ray apparatus is shown in FIG. 1 which is a ceiling type X-ray apparatus 1. The ceiling type X-ray apparatus is configured to take a photo when an examinee lies on the table between an X-ray tube and an X-ray film. In this apparatus, a guide rail is installed on the ceiling of the examination room, a post frame 10 is foldably connected to a support that moves along the guide rail, and an X-ray tube 2 is provided on the bottom of the post frame.

To make the post frame 10 foldable, the post frame 10 is received in a fixed member fixed to the support, and the post frame 10 comprises a main body that consists of a plurality of movable member 11 that moves upward and downward along the length of the fixed member.

In the ceiling type X-ray apparatus 1, as shown in FIG. 2(a), a guide block 30a is formed by material that has a high durability and wear-resistance by the heat-treatment because the guide block is subject to deterioration or degradation by the frictional contact with the bearing when it moves upward and downward.

In the above post frame that moves upward and downward, the guide block is manufactured separately and then is fixed to the fixed frame or movable member of the post frame by welding, etc. Therefore, the complex process for manufacturing the post frame increases the manufacture time and cost.

Moreover, in the conventional post frame structure, since the guide block 30 is in surface contact with the bearing, a friction increases and a lot of energy is required to move X-ray apparatus upward and downward. Due to the non-uniform surface-contact with the bearing 21, a spring balancer (not shown) is further provided in the main body 11 and the bearing 21 is pressed against the guide block 30 by the elastic force of the spring balancer.

Further, when the post frame rotates to take a photo of an examinee, the guide block 30 having a box-shape causes torsion and noise. Since the bearing 21 and the guide block 30 have a weak wear resistance, they are liable to be broken. When broken, the whole main body 11 has to be replaced and therefore the cost increases.

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To solve the above problem, the side of the guide block 30 that is in contact with the bearing 21 can be rounded as shown in FIG. 2(b). However, the rounding of the side of the guide block 30 increases a manufacturing time and cost.

Meanwhile, a prior ceiling type X-ray apparatus has a problem that the tension load difference of the spring balancer is high for the travel section of the post frame. The longer the travel section of the post frame, i.e., the travel length of the X-ray tube, is the more springs are wound on the spring balancer. Assuming the travel length of the X-ray tube is 1,500 mm, the difference in the tension load of the spring balancer between the starting point of the travel length and the end point of the travel length is substantial. The difference in the spring tension exerts substantial load on the X-ray apparatus. This results in a deterioration or degradation and in turn requires much energy to operate the apparatus.

To solve the above problem, the inventor has designed a ceiling type X-ray apparatus to reduce a load of the apparatus as shown in FIG. 3. This apparatus comprises a wire drum 31; a wire taper drum 32 arranged coaxially with the wire drum and having a plurality of steps on which wire is wound; and an acceleration drum 33 on which a wire from the wire taper drum is wound and which has a diameter smaller than that of the spring drum, wherein the wire drum consists of a plurality of wire drums having different diameter, and wherein a wire wound on the wire drum having a smaller diameter is connected to the spring balancer, thereby reducing the tension load difference between the starting point and the end point of the spring balancer even for the long travel length of X-ray tube.

However, the ceiling X-ray apparatus is provided with only one line of wire that is wound on the wire taper drum. The destruction of the wire causes a non-working of the apparatus and an accident.

To solve the above problems, the present invention provides a post frame for X-ray apparatus that reduces a manufacturing time and cost by improving a structure for raising and lowering the post frame and that reduces an energy for operating the apparatus by reducing the friction between a bearing and a guide block.

Another object of the present invention is to provide an adjustable length post frame for X-ray apparatus that reduces torsion or noise during the movement or rotation of the post frame and reduces cost by increasing durability.

Another object of the present invention is to reduce a load exerted on X-ray apparatus by reducing the difference in tension load between the starting point and the end point for the long travel length of X-ray tube, to save energy required to operate the apparatus and to prevent a stop of the apparatus and an accident when wire is cut.

SUMMARY OF THE INVENTION

To achieve the object of the present invention, the present invention provides a post frame for ceiling type X-ray apparatus, comprising: a main frame comprising a fixed frame fixed to an X-ray apparatus and a plurality of movable frames received by and arranged in the fixed frame; and a bearing part provided on the main frame, wherein the main frame comprises: a guide integrated with the main frame, that protrudes inward from the main frame and has an insertion groove at both sides; and a connecting bar that is inserted into the insertion groove and is in contact with a bearing of the bearing part.

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In one preferred embodiment, the insertion groove is opened partially, the connecting bar protrudes outward from the guide when it is inserted, and the connecting bar is formed of heat-treated material.

In one preferred embodiment, the bearing part has a bearing, a bracket for holding the bearing and a member for connecting the bracket to the main frame.

In one preferred embodiment, the post frame further comprises a blocking member that is provided on one end of the main frame to prevent the connecting bar from being removed from the main frame.

Advantageously, a ceiling type X-ray apparatus according to the present invention comprises: a first guide rail provided on the ceiling; a second guide rail arranged perpendicularly to the first guide rail below the first guide rail to move along the first guide rail; a main body arranged to move along the second guide rail; a post frame arranged below the main body to be folded upward and downward; and an X-ray tube rotatably coupled below the post frame; wherein the main body comprises: a spring drum; a pair of wire taper drums placed coaxially with the spring drum and having a plurality of steps on which wire is wound; and an acceleration drum on which the wire of the pair of wire taper drums is wound and which has a diameter smaller than that of the spring drum, wherein the pair of wire taper drums are arranged coaxially opposed to each other.

As described above, according to the post frame for X-ray apparatus, the guide can be integral with the post frame having the same material without a heat-treatment of the guide. Therefore, the welding of the guide is not required and the manufacturing time and cost for the post frame is reduced.

Further, the connecting bar can be assembled easily by simply inserting it into the guide groove. Since only the connecting bar is needed to be heat-treated, time and cost for manufacturing the post frame is reduced. The bearing is in line-contact with, not in surface-contact with, the connecting bar to reduce the friction and in turn energy for moving the post frame.

Further, torsion or noise is reduced during the movement of the post frame and durability is also increased, thereby maintenance cost being reduced.

Further, a ceiling type X-ray apparatus according to the present invention can reduce a load on the X-ray apparatus and an energy for the movement of the apparatus by reducing the tension load difference of the spring balancer between the starting point and the end point even when the travel section of an X-ray tube is long, and can prevent a stop of the apparatus and an accident even when wire is cut.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described by way of an example in a preferred embodiment by referring to a drawing, whereby additional advantageous details can be learned from the figures in the drawing.

FIG. 1 shows a conventional ceiling type X-ray apparatus.

FIG. 2 shows top views of examples of conventional post frame.

FIG. 3 shows a conventional ceiling type X-ray apparatus.

FIG. 4 shows a perspective view of a post frame according to the present invention.

FIG. 5 shows an exploded perspective view of a post of the post frame according to the present invention.

FIG. 6 shows a top view of the main frame according to the present invention.

FIG. 7 is a cross sectional view taken along A-A' line in FIG. 6 according to the present invention.

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FIG. 8 shows a bottom view of a blocking member according to the present invention.

FIG. 9 shows a perspective view of a ceiling type X-ray apparatus according to the present invention.

FIG. 10 shows a main part of the ceiling type X-ray apparatus according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, examples of an adjustable length post frame **100** for X-ray apparatus and ceiling type X-ray apparatus therewith will be described in detail referring to attached drawings.

FIG. 4 shows a perspective view of the post frame according to the present invention, FIG. 5 shows an exploded perspective view of the post frame according to the present invention, FIG. 6 shows a top view of the main frame according to the present invention, FIG. 7 is a cross sectional view taken along A-A' line in FIG. 6 according to the present invention, and FIG. 8 shows a bottom view of a blocking member according to the present invention.

As shown in FIGS. 4 to 8, the post frame **100** for X-ray apparatus comprises a main frame **110**, a connecting bar **130** and a bearing part **20**.

The main frame **110** comprises a fixed frame **111** arranged outmostly and a plurality of movable frames **112** received and installed in the fixed frame.

The fixed frame is attached to X-ray apparatus and the movable frame is received in the fixed frame **111** in such a manner that it move upward and downward along the length of the fixed frame **111**. At least one supporting bracket **111a** is installed on the upper part of the fixed frame **111** for the connection to the X-ray apparatus.

Since the fixing of at least one movable frames **112** received in the fixed frame **111** during the folding of the main frame **110** is a well-known technique in the field, descriptions for the fixing will not be described herein.

The main frame **110** is a hollow rectangular member and the inner face of the main frame **110** are provided with a plurality of guides **114** protruding inward.

The guides **114** have the same material as the main frame and may be configured to be integral with the main frame. The integral structure is achieved by making a mold in such a manner that the guides are connected to the main frame.

The guides **114** have an insertion groove **115** respectively on both sides and the groove **115** is opened partially. A connecting bar **130**, which will be described hereinafter, is inserted into the insertion groove.

In this example, the main frame **110** has a rectangular shape, not limited to this shape, but may have various shapes such as polygon.

Further, a blocking member **150**, as fixing means, may be provided on the bottom surface of the main frame **110** to prevent the connecting bar **130** from being removed from the main frame.

The connecting bar **130** has a length that is the same as or a little bit smaller than that of the main frame **110**. The connecting bar has a radius that is a little bit smaller than that of the insertion groove **115** or that is the same as the insertion groove such that the connecting bar is tightly inserted into the groove. The dimension of the length and radius is not limited to the above. Both ends of the connecting bar **130** may be tapered or rounded to facilitate the insertion of connecting bar into the groove **115**. Alternatively, the connecting bar inserted into the groove is protruded out of the guide to contact a bearing as will be described hereinafter.

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Moreover, the connecting bar **130** may be heat-treated to prevent degradation or deterioration caused by the frictional contact with the bearing **21**.

The bearing part **20** comprises a bearing **21**, a bracket **22** for holding the bearing and a bearing-engagement member **23**.

The bearing **21** is configured to rotate while being in line-contact with the outer surface of the connecting bar **130**. In this example, a plurality of bearings **21** are provided, but not limited to this. Any arrangement will be sufficient as far as the bearing rotates in line-contact with the connecting bar.

The bearing **21** is engaged with the bracket **22** in such a manner that the bearing rotates.

The bearing-engagement member **23** is provided on the bracket **22**, and one end of the member is fixed to the inner frame of the main frame and the other is inserted into a groove of the guide formed on the outer frame of the main frame.

The post frame according to the present invention is configured such that when the main frame **110** moves upward and downward, the bearing **21** of the bearing part **20** rotates and is in line-contact with the connecting bar inserted in the main frame **110** along the outer surface of the connecting bar **130**, thereby generating friction heat, but degradation or deterioration can be prevented by the heat-treatment of the connecting bar **130**.

Further, even if the degradation or deterioration causes a destruction of the connecting bar **130**, the connecting bar **130** inserted in the insertion groove **115** can be replaced easily, which facilitate an effective maintenance of the main frame **110**.

Since the connecting bar **130** has the shape of a cylindrical rod, the bearing **21** in line-contact with the connecting bar **130** slides smoothly along the outer surface of the connecting bar **130** even when a force is exerted perpendicularly to the length of the main frame **110**. Therefore, the destruction of the bearing can be avoided and the main frame **110** can be rotated with a slight force.

A ceiling type X-ray apparatus **200** according to the present invention comprises guide rails **210** and **220**, a main body **230**, a post frame **100** and an X-ray tube **250**.

The guide rails consist of a first guide rail **210** and a second guide rail **220** that are arranged to cross at right angles. The first guide rail **210** is located on the ceiling of the examination room and consists of a pair of rail frames **211** on which a rail groove is provided and connecting frames **212** that connect the pair of rail frames. A plurality of rollers (not shown) are disposed on the rail frame **211** such that they move along the rail frame.

The main body **230** is provided below the second guide rail **220** such that it can move along the second guide rail **220**. The main body **230** comprises a spring drum **231**, wire taper drums **232** and **233**, and an acceleration drum **234**.

The spring drum **231** exerts an elastic force during the winding of wire. The wire taper drums **232** and **233** are placed coaxially with the spring drum and have a plurality of steps on which wire is wound. Also, the wire taper drums are coaxially opposed to each other.

The acceleration drum **234** comprises a first acceleration drum **234a** and **234b** and a second acceleration drum **234c**. Wires from the wire taper drum are wound on the first accel-

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eration drums **234a** and **234b**, respectively. The second acceleration drum **234c** is placed coaxially with the first acceleration drums **234a** and **234b** and has a diameter larger than (e.g., two times larger than) that of the first acceleration drum, and another wire connected to the X-ray tube is wound on the second acceleration drum **234c**.

The above arrangement allows the travel section of a spring balancer to be reduced. In particular, assuming that the actual displacement of the X-ray tube is L, a first wire (w1) wound on the first acceleration drum travels L/acceleration rate (in this embodiment, the acceleration rate is 2) and a second wire (w2) wound on the second acceleration drum travels L, since the first and second acceleration drums are placed coaxially and rotates together and the diameter of the second acceleration drum is two times larger than that of the first acceleration drum.

Therefore, the travel length of the wire taper drum and the spring drum on that the first wire is wound can be reduced to half of the actual displacement of the X-ray tube. The tension load difference of the spring balancer between the starting point and the end point is also reduced.

As described above, the spring drum is provided with a pair of wire taper drums and each wire is wound on the wire taper drums, respectively. Therefore, even when one of the wires is cut or destroyed, the spring drum keeps rotating properly with no interruption during the winding of wire and no accident caused by a wire-cut occurs.

It is intended that the foregoing description has described only a few of the many possible implementations of the present invention, and that variations or modifications of the embodiments apparent to those skilled in the art are embraced within the scope and spirit of the invention.

What is claimed is:

1. A post frame for an X-ray apparatus, comprising:

a main frame comprising a fixed frame fixed to the X-ray apparatus and a plurality of movable frames received and arranged in the fixed frame; and a bearing part provided on the main frame,

wherein the main frame comprises:

a guide that is integral with the main frame, protrudes inward from the main frame and has insertion grooves at both sides; and

a pair of connecting bars that are inserted into each insertion groove and are in line-contact with a bearing of the bearing part, wherein the bearing part has a pair of bearings, a bracket for holding the bearings and a member for connecting the bracket to the main frame.

2. The post frame according to claim 1, wherein the insertion grooves are opened partially and the connecting bars protrude outward from the guide while the connecting bars are being inserted, and the connecting bars are formed of heat-treated material.

3. The post frame according to claim 1, further comprising a blocking member that is provided on one end of the post frame to prevent the connecting bars from leaving out of the post frame.

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